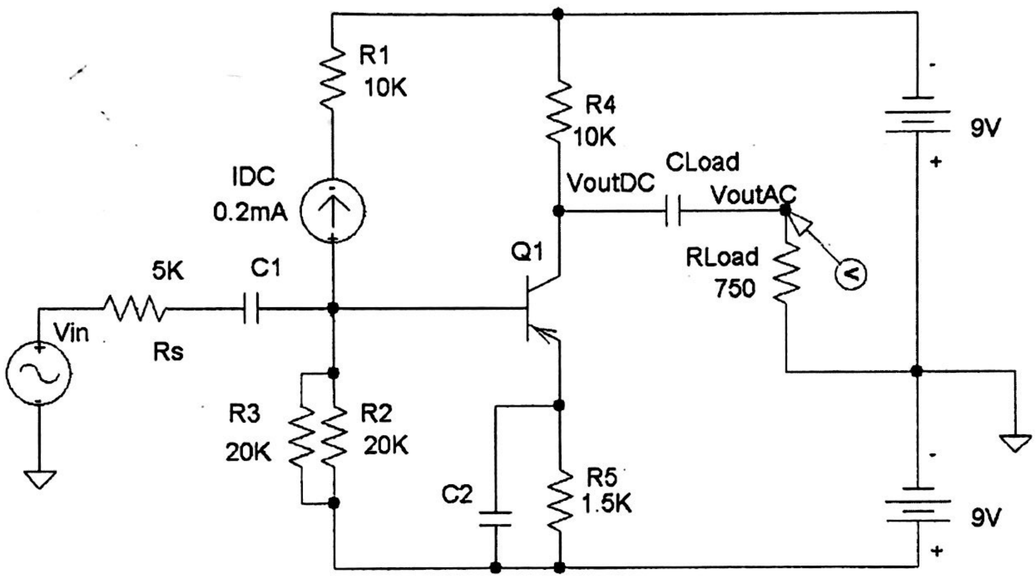
Problem 1

For the circuit below: $V_{EB(on)}$=0.64 V, β=200, V_A=100 V, V_{inAC} = 1 mV amplitude (i.e., 2m V peak to peak sinusoidal signal) at 1 KHz.



Given the above input voltage, V_{inAC}, sketch and accurately label a plot the output waveforms V_{out} on the graph paper provided on the next page. You may assume all capacitors are very large values and are thus, AC shorts.

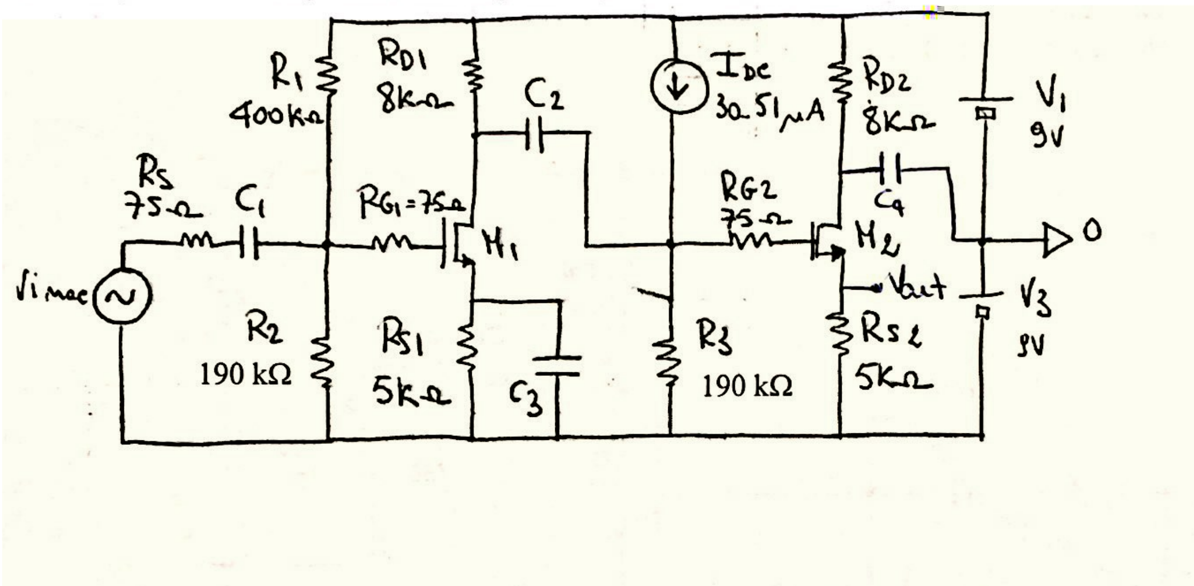
Problem 2

For the circuit below: V_{TN}=0.5 V, K'_n=100 $\mu A/V^2$, λ=0.1 V^{-1}, W=0.18 μm, L=5 μm, V_{inAC} = 1 mV amplitude (i.e., 2m V peak to

(a) Identify the configuration for the first and the second stage.

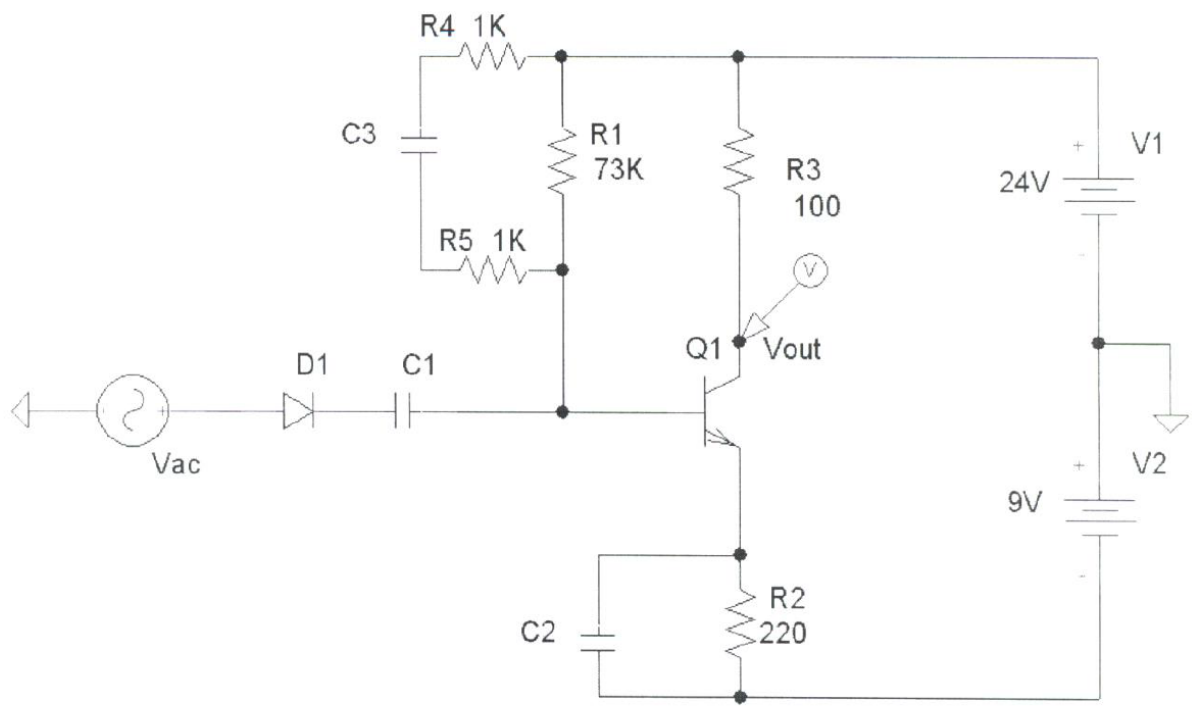
(b) Calculate the total small-signal voltage gain.

You may assume all capacitors are large enough to act as short-circuits in ac.



Problem 3

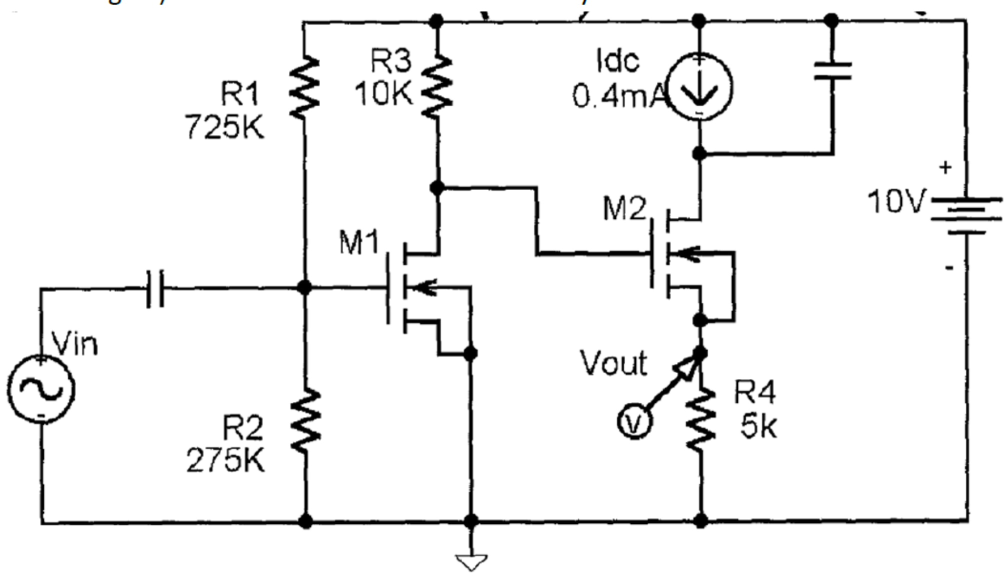
For the circuit below r_{diode}=1kβ ,Ω=100, V_A=15 V, V_{inAC} = 1 mV amplitude (i.e., 2m V peak to peak sinusoidal signal) at 1 KHz.



Given the above input voltage, V_{inAC}, sketch and accurately label a plot of the output waveform V_{out} on the graph paper provided below. Replace the diode with the resistor r_{diode} in the small-signal analysis. Assume the turn on voltages for all forward biased junctions are 0.7 V. You may assume all capacitors are very large values and are thus, AC shorts.

Problem 4

For the circuit below: V_{TN}=1 V, K_n=125 $\mu A/V^2$, λ=0.1 V^{-1}, V_{inAC} = 1 mV amplitude (i.e., 2m V peak to peak sinusoidal signal) at 1 KHz. M1 and M2 are nominally identical transistors



(a) Identify the configuration for the first and the second stage.
(b) Calculate the total small-signal voltage gain.